

Upper Wakulla River and Wakulla Springs Basin Management Action Plan

Technical Meeting Summary

Thursday, April 18, 2013

9:30 AM – 12:00 PM

Woodville Community Center, Live Oak Room

8000 Old Woodville Road, Tallahassee, Florida 32305

Attendees

Joseph Addae-Mensa, DEO	Cataia Ives, Citizen
Craig Barkve, Tallahassee	Cal Jamison, Friends
Kris Barrios, NFWFMD	Brian Katz, FDEP
Winston Borkowski, Hopping Green & Sams	Howard Kessler, Wakulla County
Catherine Bray, Tallahassee	John Kraynak, Leon County
Dana Bryan, FDEP	Debbie Lightsey, Citizen
Kathy Burke, Leon County	Roy Lima, Florida Forest Service
Tiffany Busby, Wildwood Consulting	Alex Mahon, Leon County Health Department
Steve Cioccia, FDEP	Odemari Mbuya, FAMU
Melissa Corbett, Wakulla County	Sean McGlynn, MLI
John Cox, Tallahassee	Katherine Milla, FAMU
Christy Crandall, FAMU	Anita Nash, FDEP
Hal Davis, Citizen	Keith Parmer, KDP R&D
Holly Edmond, FDACS	Steve Peene, ATM
Kirstin Eller, FDEP	Ron Piasecki, Friends of Wakulla Springs
Rance Ellis, FDACS	Marcy Policastro, Wildwood Consulting
Eric Etters, Tallahassee	Terry Pride, FDACS
John Folks, FAMU	Eberhard Roeder, FDOH
Charlie Gauthier, FDEP	Peter Scalco, FDEP
Katherine Gilbert, Citizen	Luis Serna, Wakulla County
Blas Gomez, Tallahassee	Charles Shinn, Florida Farm Bureau
Johnny Grace, USFS Southern Research	Lee Smith, ECT
Pam Hall, Citizen	Ed Steinmeyer, Leon County
John Hallas, Talquin Electric Cooperative	Jim Stevenson, Citizen
Kenny Hayman, FDEP	Herb Thiele, Leon County
Theresa Heiker, Leon County	Brian Wiebler, Tallahassee
David Henry, Tallahassee	Bruce Wilson, Ecology and Environmental, Inc.
Rick Hicks, FDEP	Mark Yelland, DEO
Linda Hudson, Tallahassee	Laura Youmans, Leon County
Brian Icerman, Jones Edmunds	

Welcome and Introductions

Tiffany Busby welcomed everyone to the Upper Wakulla River and Wakulla Springs Basin Management Action Plan (BMAP) meeting. The participants introduced themselves and the entity they represent.

Florida Department of Environmental Protection Nitrogen Isotope Study

Brian Katz stated that his presentation focuses on nitrate isotopes, which use both nitrogen and oxygen to identify different pollutant sources. All elements have more than one isotope, some of which are stable and do not decay and some of which are unstable (radioactive). Nitrogen has two stable isotopes, ^{14}N and ^{15}N . Nitrogen also has four radioactive isotopes that have very short half-lives, so these isotopes do not exist for long. Oxygen has three stable isotopes: ^{16}O , ^{17}O (most common), and ^{18}O . Oxygen also has six radioactive isotopes with very short half-lives. Changes in the ratio of the less abundant to more abundant isotope (^{15}N : ^{14}N and ^{18}O : ^{16}O) are evaluated to follow the processes in the environment. Changes in the ratio of nitrogen isotopes are reported relative to atmospheric nitrogen, which makes up about 80% of the

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gases in the atmosphere. If a sample has a value of 0 parts per thousand (ppt), it has the same composition as atmospheric nitrogen. If the value is higher, the sample contains more ^{15}N , and if the value is lower, the sample contains more ^{14}N . Oxygen isotope data are reported relative to standard mean ocean water, also in ppt.

Brian stated that isotopic fractionation is informative because the isotopes separate out differently during biological processes, such as nitrification and denitrification. During these processes, the lighter isotope is concentrated in the products and the heavier isotope is concentrated in the reactants. Therefore, the residual nitrate develops a higher level of ^{15}N and ^{18}O through these biological processes. Denitrification is the conversion of nitrate to nitrogen gas by bacteria. Bacteria prefer the lighter isotopes so these are used in the conversion process and become nitrogen gas, while the heavier isotopes remain in the water. As a result of biological processes, changes in the isotopic concentrations can be seen in the environment. Different sources of nitrates, such as atmospheric, fertilizer, soil, and manure/waste from septic tanks/wastewater treatment facilities (WWTF) have different nitrate isotope signatures. However, there is some overlap in the signatures of soil and waste, so other tracers are needed to identify the source. The isotopes in the soil and waste portion of the plot typically follow a denitrification trend line. Christy Crandall asked if there a specific speed associated with the denitrification trend line. Brian responded that the speed could be obtained by using information about the disappearance of nitrate over time.

Brian stated that the Florida Department of Environmental Protection (FDEP) collected data in 2011 from the different tunnels around Wakulla Springs and from the springs themselves. Brian showed a map that indicates the groundwater flows from dye tracer studies in the areas and the nitrate isotopic concentrations. The size of symbol on the map represents the level of nitrate concentrations from human sources. The A-K and K tunnels in the south and west have a much lower wastewater signature than the B, C, and D tunnels in the north and east. The springs are also showing a significant wastewater nitrate signature. The data collected by FDEP from March-December 2011 plot in the wastewater/manure signature field. To determine if the nitrate is coming from humans or livestock, another tracer is needed. FDEP has started using sucralose as a tracer for human sources, and it is the main ingredient in Splenda. Studies from around the world have detected sucralose in groundwater with human wastewater influences. Sucralose is very stable, passes through the wastewater treatment into the final effluent, and is not affected by chlorination or tertiary-grade treatment. Sucralose has the added advantage that it is never used in animal feed and is therefore not expected to be present in the byproducts of animal waste. The median sucralose levels in the tunnels, based on data from 2011-2012, show slightly elevated concentrations in the A-K Tunnel (0.011 parts per billion [ppb] and K Tunnel (0.013 ppb). Brian noted that the detection limit for sucralose is 0.01 ppb, so these tunnels have concentrations close to the detection limit. The and B and D Tunnels had a sucralose concentration of 0.033 ppb and the B and C Tunnels have a concentration of 0.035 ppb, which indicates a human influence coming from the north and east. This is consistent with findings from other studies.

Brian stated that another study was conducted at the Tallahassee wastewater sprayfield by the U.S. Geological Survey (USGS) and the City of Tallahassee. Samples were collected from wells and springs down gradient from the sprayfield and some samples were also collected up gradient. During this same time, Dr. Todd Kincaid with the Florida Geological Survey (FGS) conducted a dye tracer study, which found that dye introduced at the sprayfield moves to Wakulla Springs. Areas where dye was found also had a nitrate isotopic signature that indicated wastewater as a source. Some of the monitoring sites had isotope signatures that plotted along the denitrification line. Once nitrate enters the aquifer, it behaves conservatively and does not appear to undergo denitrification because it moves with chloride, which is also conservative in groundwater.

Brian noted that a septic tank study was also conducted by USGS and FDEP in the Woodville Karst Plain. Nitrate isotopes were measured using lysimeters in different parts of a septic system including in the tank,

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drainfield, and shallow groundwater. Outside of the drainfield, they found that all the samples trended along the denitrification line. This accounted for about 15%-30% of the nitrate that was lost through denitrification, which prevented the nitrate from entering the groundwater. Brian stated that at one site, a homeowner had applied fertilizer a few months before the study and they were able to pick up a distinct fertilizer signature in those samples.

Brian stated that nitrate isotopes could provide useful information about the contaminant sources and nitrate transformation processes through the nitrogen cycle. These isotopes are just one tool in a toolbox that can be used to identify different sources. Information on land uses and hydrology and other chemical indicators are needed to better understand the different sources and processes that are occurring in the basin.

Nitrogen Loading Estimates to Groundwater for the Wakulla Springs Basin

Kirstin Eller stated that when FDEP started this project, the goal was to obtain an idea of what sources were contributing to the Wakulla springshed. Kirstin noted that this is a dynamic tool and they want to add new information to it over time. The first step in the process was to select a basin on which to focus. They evaluated the Ochlockonee-St. Marks Basin (too large of an area), the Chelette report boundary, and the total maximum daily load (TMDL) boundary. Kirstin stated that they decided to use the springshed boundary from the TMDL document; however, they can update the calculations to the BMAP boundary once it is finalized.

The study area was divided into three areas based on the level of confinement in the Upper Florida Aquifer: confined, semi-confined, and unconfined (below the Cody Scarp). Several sources of nitrogen were examined including atmospheric deposition, WWTFs, septic tanks, fertilizers (farm and residential), livestock waste, and sinking streams. Total nitrogen (TN) data for these sources from 2002-2012 were used in the study. Wet deposition data were available from sites in Sumatra and Quincy, and the Sumatra site also collects dry deposition data. In evaluating the wet and dry data, they found that the data were consistent, so they were able to use the dry deposition data in the study. Kirstin presented a map that showed the WWTFs in the basin and data from these facilities were used in the study. Septic tank locations were determined using a Florida Department of Health (FDOH) model that relies on tax parcel information and known sewer areas. The 2010 U.S. Census was used for the number of people per household to estimate the septic tank loading, based on an average input per person of 4.24 kg of TN/yr.

The livestock data were obtained from the Census of Agriculture that is provided by the Florida Department of Agriculture and Consumer Services (FDACS) every five years. The data from the Census of Agriculture is only available on a county basis. Kirstin stated that they felt using the county data would overestimate the loadings in the basin (which does not follow county boundaries) so they evaluated aerial imagery to count the number of horses and cows in the basin. The counts from this interpretation were used in conjunction with average loading estimates for each of these livestock types. The fertilizer data were also obtained from FDACS because they have information on fertilizer sales by county. Kirstin stated that they used the total weight of fertilizer and the total weight of nitrogen in the fertilizer to calculate the percentage of nitrogen in all of the fertilizer sold. This percentage was then applied to the total fertilizer used for farm practices and non-farm practices to determine the amount of nitrogen. Since the data were for the full county, they had to cut this information down to the pieces they needed for the study. To do this, they looked at land use categories for farmlands that use fertilizer by county. They then calculated the total acreage in these categories and the percentage in the springshed, and in the unconfined, semi-confined, and confined areas. These percentages were multiplied by the farm fertilizer data for each county in the springshed. The same process was used for the residential fertilizer, focusing on different land use categories.

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The sinking streams evaluated in the study were Fisher Creek, Black Creek, and Munson Slough. Kirstin stated that they did not include Lost Creek in the study because where it disappears is outside of the study boundary. Kirstin presented the pie chart from the Chelette et al. report (2002), which showed the percent contribution of sources based on data from 1990-2000. This chart was compared to the chart from FDEP's study, which used data from 2002-2012. Kirstin noted that the two studies cover different areas so the charts are not directly comparable.

The loading information is based on the amount of nitrogen applied to the land surface. Kirstin stated that they wanted to account for nitrogen attenuation in the environment. Based on past studies and literature, they determined attenuation factors for each of the sources. For example the attenuation factor for atmospheric deposition is 90%; therefore, 90% of the atmospheric nitrogen will be taken up and the remaining 10% has the potential to enter the groundwater. They also had recharge factors for each of the three areas in the basin. In the confined area, only about 10% of the unattenuated nitrogen will make it to the groundwater. In the semi-confined area, the recharge factor is 40% and the factor is 90% in the unconfined area. With the attenuation and recharge factors, WWTFs and septic tanks have the highest loading to the groundwater (each approximately 30% of the TN reaching the Floridan Aquifer).

Most of the nitrogen into the groundwater is from the unconfined region (64%), followed by the semi-confined (23%), and confined (13%). In the confined region, the largest source is farm fertilizer. In the semi-confined region, the largest source is septic tanks. In the unconfined region, the largest source is WWTFs. Kirstin noted that as the BMAP process moves forward, the stakeholders will need to determine how best to address the sources and the focus should be on the unconfined area in the basin. Kirstin stated that the City of Tallahassee upgraded their WWTF, which had a pre-advanced wastewater treatment (AWT) TN concentration of 12 mg/L, and comprised 39.4% of the total load to the groundwater. The post-AWT TN concentration is 2.6 mg/L, which is about 22.5% of the total load to the groundwater. Kirstin stated that if the right change is made in the right place, it can have a dramatic affect on the loading.

Questions on the Presentations

Terry Pride noted that the percentage of the WWTF input decreased after the AWT upgrade but the percentages of the other sources all increased. Kirstin responded that the overall loading decreased after the AWT upgrade, but it changed the percent contributions from the other sources. Christy stated that the study area is cut off at the state line but there are small creeks in Georgia near the state line that have hog populations around them. She asked if FDEP evaluated loading from across the state line. Kirstin responded that they did not evaluate any loading from across the state line but this is the confined area so only about 10% of the loading will reach the groundwater. Odemari Mbuya asked if they evaluated the different species of nitrogen in the study. Kirstin responded that the speciation of nitrogen was part of the attenuation factors. Steve Peene asked that even though the recharge factor in Georgia is a small percentage of the overall contribution to Wakulla Springs, if a discharge on the order of 300,000 kg/yr of TN would be a potential significant source to the groundwater. Kirstin responded that not all of that load would have the potential to reach the groundwater. While it would increase the loading, she was unable to say if this load would be significant. Theresa Heiker asked if the change in WWTF percent contribution included applying AWT to other WWTFs in the basin. Kirstin responded that this change was only made at the Tallahassee WWTF.

Blas Gomez asked if the data used to develop the information on the slides are available. Kirstin responded that the compiled data are currently not available because there is a lot information assembled for the analyses, but all the data used in the study are publicly available. Blas asked how he could obtain the data if he wanted to evaluate them to see if he reaches the same conclusion. Kirstin responded that they are not releasing the data right now because it is complicated and a large database. She stated that

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Blas could contact her if he wanted to review the data. Brian added that Blas is welcome to meet with them to review the calculations, as is anyone who is interested in reviewing this information.

Catherine Bray asked, in Brian's presentation, where does the 30% denitrification from the septic tanks occur. Brian responded that this conversion occurs in the drainfield. Blas asked if the data in Brian's presentation from 2011 were just now being analyzed. Brian responded that they just recently did the analysis because it takes a while for the data to come back from the isotope lab and to go through quality assurance/quality control before they can be analyzed.

Keith Parmer asked Kirstin if the natural contributions of nitrate to the system (wildlife, bird migrations, and tree detritus) are accounted for in the study. He also noted that he does not see anything that specially accounts for stormwater loading. Kirstin responded that the study mainly focused on anthropogenic sources in the basin. Brian added that the sinking streams data take into account stormwater runoff. Bruce Wilson asked how the different recharge factors were developed. Kirstin responded that they obtained these factors from literature. Pam Hall stated that the stakeholders have seen the data from Hal Davis' studies and she asked how this study is different. Kirstin responded that this study evaluates a different land area and includes different attenuation factors and recharge rates. The final results of this study are not that different from other reports that have been published, so everyone is coming to the same conclusions about the sources. Brian added that this study was an update to what has been done more than a decade ago to evaluate loads in the basin.

John Kraynak asked if the atmospheric deposition attenuation factor was applied uniformly throughout the basin. Kirstin responded that this factor was applied broadly across the basin. Based on literature values and other studies, 90% was within the agreed upon range for atmospheric deposition attenuation. Ron Piasecki asked how many WWTFs from Wakulla County were evaluated. The prison and Wakulla River Plantation should be included. Kirstin responded that there were no WWTFs in Wakulla County in the study's springshed. This is a very small area, as shown in the presentation, but if any facilities were missed, the stakeholders should let her know. John Hallas stated that he understands why they selected one attenuation factor for all WWTFs, but it may be better to look at the treatment process, application type, and soil type because these all affect attenuation. These factors could be important, especially since WWTFs are such a significant portion of the load. Brian responded that the WWTF attenuation factor could be refined because this study is a dynamic process. Christy noted that they might also want to collect data from a dry deposition site in Gadsden County because there is a lot of agriculture in this area.

Theresa noted that Brian mentioned that nitrate acts conservatively in the aquifer. She asked if could be assumed that stormwater that enters the aquifer retains its nitrate. Brian responded that most of the aquifer has enough oxygen to maintain nitrate. There are some deeper portions of the aquifer where the water is less exposed to oxygen, so some denitrification could occur. Eberhard Roeder asked if the estimation of loading from this study matches what comes out in Wakulla Springs. Kirstin responded that this load does not match what is in Wakulla Springs. The purpose of this study was not to come up with a mass balance of nitrate, but to estimate the percentage of contribution from different sources. Odemari asked if there was a seasonal difference in attenuation. Kirstin responded that the study did not account for seasonal differences in attenuation, but the data were collected over all seasons.

Rick Hicks stated that FDEP would like the stakeholders' input on this study. This tool is considered a draft and they would like to use this approach in other springsheds. He stated that within the next few months, the report for this study with the metadata and methods will be available. The stakeholders can contact Rick, Kirstin, or Brian with questions or comments on the study. Kirstin stated that she would add her contact information to the presentation before it is posted.

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Debbie Lightsey asked if the pie charts from the study for the changes in loading at the WWTF after the AWT upgrade are based on actual samples or from a model. Brian responded that the data are from Tallahassee on the pre- and post-AWT upgrade concentrations at the WWTF. Debbie asked if that number would change as the AWT upgrade is completed and the water in the springs has some age. Kirstin responded that everything would change because they are not looking at just one set of numbers. She was unsure if the AWT concentration would go down more than 2.6 mg/L; however, every source that was examined in the study had a decreasing trend. Brian added that it still remains to be seen how much of the lower TN concentrations at the sprayfield are being attenuated. Debbie stated that she is trying to understand how the TN concentration may or may not drop in the springs based on changes at the sprayfield. Brian responded that there is a lag time between application at the sprayfield and nitrate entering the springs. The system will need to continue to be monitored to answer this question. Keith noted that conservative tracers go through the system within three to four months, so nitrate changes from the sprayfield should be observed within a season. Brian responded that from dye tracer studies at the sprayfield, a small portion of the load made it to the springs within two months. However, at this time, the exact lag time is not known.

Pam asked if there are estimates for the confined and semi-confined areas on the length of travel time and the age of the water. She noted that there are areas north of the Cody Scarp where development on septic tanks has occurred in the last 30 years. Pam stated that she was wondering if there is a slug of nitrates from this area that has not yet made it to the springs. Hal Davis responded that this area of the basin would have a greater lag time than other parts of the basin because it is confined, but the estimated lag time would be less than 30 years.

Agriculture in the Basin

Holly Edmond stated that agricultural acreage in the basin was determined through a Geographic Information Systems (GIS) exercise using the Northwest Florida Water Management District's (NFWMD) 2009 land use/land cover. This coverage was clipped to the Upper Wakulla River and Wakulla Springs BMAP boundary, and the evaluation focused on agricultural land uses represented by the 2000-level codes and 3100 code (rangeland). Based on 2009 data, the total agricultural area in the basin is 64,244 acres, which is about 8% of the basin. The majority of agriculture is in Gadsden County (about 32,000 acres). The remainder of the agricultural area is mostly in the eastern portion of Leon County, with some areas in Wakulla County. Since 2004, there has been a decrease in about 58,000 acres of agricultural areas. Most of these changes occurred in Leon County through urban conversion or reclassification from unimproved pasture to forestry; silviculture lands are included in a different land use category than agriculture. Currently, there are 7,208 agricultural acres enrolled in best management practices (BMPs) in the BMAP area. Of these enrolled acres, 2,752 acres are container nurseries, 1,467 acres are row crops, and 2,988 acres are cow/calf operations.

Terry stated that BMPs are a practical means for agricultural producers to reduce water quality impacts. BMPs are developed through field-testing and research by the Natural Resources Conservation Service (NRCS), University of Florida–Institute of Food and Agricultural Sciences (UF-IFAS), and others. FDACS has developed BMP manuals for different commodities, and FDEP then reviews the literature and monitoring on the BMPs to give them initial verification as effective in reducing pollutant loadings. The focus of the BMPs is on nitrogen and phosphorus, although some practices also help with fecal coliforms. BMPs must be economically feasible for the producers. Terry noted that some of the BMP manuals also include practices that would require cost-share funding, and FDACS, FDEP, and the water management districts try to provide funding for those BMPs, when available. BMP manuals are currently adopted for citrus, vegetable/row crop, container nursery, sod, cow/calf, conservation plan rule, specialty fruit/nut, and equine. Terry stated that FDACS recently adopted a statewide citrus manual to replace the four previous manuals that were regionally based. FDACS is in the process of revising the vegetable/row

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crop manual and the container nursery manual to include in-ground nurseries. The conservation plan rule encompasses livestock, poultry, and other animals.

Terry stated that by statute, agricultural producers have to either enroll in and implement BMPs or conduct water quality monitoring, which is costly. At this time, no producer has opted to monitor instead of implementing BMPs. If a producer does not implement either of these options, FDEP and the water management districts have the authority to take enforcement action. In a BMAP, FDACS typically has a target enrollment to give them time to talk with and enroll producers in BMPs. FDACS will continue to work with agricultural operations in the BMAP basin to enroll them in the BMP program. Terry stated that they would focus their efforts based on the BMAP priority areas, which will be discussed later in the meeting. They will also work on enrolling producers in other portions of the basin and will provide cost-share funding, when available. Terry stated that Rance Ellis is the one FDACS field person for the entire NFWFMD area, and he does have some help from FDACS staff in three counties. Rance has not been able to do a work a lot in the Wakulla area because he has a lot of ground to cover. However, he will focus more effort in this area once the BMAP has been adopted. Terry noted that, on average, BMP implementation is expected to achieve an estimated 30% nutrient load reduction. This estimate is based on a 2008 report by Del Bottcher.

Rance stated that his job is to work with producers directly to enroll them in the appropriate BMP program. BMPs fall into two categories. The first category is structural BMPs, which occur physically on the land or are done to the land including installation of culverts and risers to create tailwater recovery and installation of center pivots for irrigation. These BMPs must be economically feasible for the producer or they will not implement them. The secondary category is management BMPs, which mostly include irrigation/nutrient management. Rance stated that he talks with the producers about record keeping to help track nutrients. The nutrient management BMPs include soil testing to ensure the producers are applying the correct amount of fertilizer, typically at or below the UF-IFAS recommended rates for their commodity. Rance stated that irrigation management is not much of a problem in this area because there are mostly dry crop farms. There are some pivot systems in Georgia near the Florida border, and there will likely soon be requests for irrigation in the BMAP area too, to help alleviate the uncertainties of depending solely on rainwater. Rance stated that he conducts an assessment of each farm to identify applicable BMPs. The producer then submits a notice of intent (NOI) and the checklist from the manual on the appropriate BMPs. Those producers that implement and maintain the BMPs have a presumption of compliance with state water quality standards.

Keith asked if there is a program in FDEP that standardizes the BMP verification and what entity in FDEP does this verification. Terry responded that FDACS works mainly with Mike Thomas at FDEP on BMP verification. There is a process that he follows to determine the initial verification. The second stage of verification that is contemplated in the statute is referred to as “confirmatory verification” and involves monitoring the BMPs at set sites. This confirmatory monitoring has been done in one case for the ridge citrus nitrate BMP, and involved monitoring over five to six years. The groundwater group at FDEP was involved in this monitoring. Terry noted that this type of verification is very costly and there has not been any dedicated funding for this work. This verification is FDEP’s responsibility in statute, and there was a technical advisory committee that determined a process for verification a few years ago. Keith stated that there seems to be a big gap in the information since none of the BMPs have been verified. Terry responded that there are areas around the state where verification is occurring, such as in the Everglades. Keith asked if the rule specifies the process to verify the BMPs. Terry responded that the rule does not specify a process.

Rick noted that the groundwater group at FDEP has been involved in BMP monitoring in some areas with adopted BMAPs. In these cases, as NOIs are signed for BMP implementation, they strategically place monitoring wells. FDEP is currently setting up this monitoring in the Santa Fe Basin. Keith stated that

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agricultural compliance is based on the BMP program and there is no information to verify that the BMPs work. Terry responded that most of the BMPs are well established. It is also common sense that if the application of fertilizer were reduced, then the nutrient loads would be reduced. The approach for BMP verification in the Santa Fe Basin is based on identifying restoration focus areas to monitor the effectiveness of the BMPs.

Debbie asked if the areas shown as agriculture on the map have been verified as active agricultural sites or is the information just based on land uses. She also asked how FDACS works with the larger commercial operations in the basin, as opposed to the smaller farmers. Rance responded that FDACS conducts outreach efforts through the NRCS and producer groups. It is sometimes difficult to tell who owns the land, but they will try to reach out to all the producers. Terry added that for the smaller operations, FDACS is working with FDEP and NRCS on outreach. The BMP manuals are directed at the larger operations. Odemari noted that at one time, a certain amount of money from fertilizer sales went towards implementing BMPs. He stated that something similar should be put in place to verify the BMPs. Terry responded that FDACS and FDEP agree that BMP verification is needed. Using part of the fertilizer sales to fund this effort would require a significant legislative request.

Dana Bryan asked if the 30% nutrient load reduction is the ideal if the BMPs are followed as needed. Terry responded that this percentage is the average for all types of BMPs, and some are more efficient than others. This percentage came from literature values and monitoring data. Dana noted that Rance mentioned that some of the producers are reluctant to implement BMPs if they do not provide a benefit to the producer. He asked what FDACS says to producers in these circumstances. Rance responded that he tells the producers that over time they will save money. Implementing more efficient fertilizer practices significantly cuts down the on the amount of fertilizer needed. Anita Nash noted that one good example of this is the use of Global Positioning System (GPS) on the tractors so they do not overlap areas when applying fertilizer. This helps to save on the amount of fertilizer used and allows for application at a rate that plants can absorb. Rance added that this is an example of a structural BMP that FDACS is cost-sharing in the Jackson/Blue Springs area. Terry noted that while northwest Florida is a relatively new area for FDACS to focus on NOIs, producers around the state have been active in the BMP programs and are excited about using new technologies. For example, FDACS is part of a partnership in the Tri-County Agricultural Area in the Lower St. Johns River Basin, and producers in that area have been very active. This is an area where FDACS will be adding BMP monitoring and building our dataset on BMP effectiveness.

Follow Up on the BMAP Basin Boundary

Anita stated that during the last meeting, Johnny Richardson (Leon County) had a concern that the entire surface watershed for Lake Miccosukee was not included in the BMAP basin because there are known swallets in this area. Anita stated that in order to decide whether to expand the basin to include this watershed, FDEP looked at the available data in this area. Lake Miccosukee is more like a swamp because it is covered in vegetation with a few channels cut for fishing. There are several tributaries that go into the lake and the lake drains out to the south. There is a sink in the northwest corner of the lake, but water from outside of the BMAP boundary is not expected to flow in this direction because it is uphill. There are not enough data for the tributaries to determine if they are impaired for nutrients, but none of the available nutrient data appeared to be high. Therefore, FDEP did not see a reason to expand the BMAP boundary to include more of the Lake Miccosukee watershed at this time. Kris Barrios noted that there are a number of sinkholes in the southern part of the lake, so there is a lot of surface water/groundwater interaction in that area. However, the nitrate level in the lake and streams are low so there is no real reason to include this area in the BMAP. Pam stated that most of the nitrogen is contained in the vegetation that covers the lake. When the vegetation dies back, it releases the nitrogen, and then when the vegetation grows back, it takes up the nitrogen again.

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Identification of Priority Restoration Areas and Sufficiency of Effort Evaluation Process

Steve Cioccia stated that the BMAP is an iterative process so the priority focus areas (PFAs) are for the first iteration. The BMAP covers a large area and it is not effective to divide efforts across this entire area; therefore, FDEP has identified PFAs to focus management strategies in the areas that are expected to have the most impact on the springs. This approach maximizes the effectiveness of strategies to give the “most bang for the buck.” To identify the PFAs, FDEP reviewed the contributing areas to the Upper Wakulla River and Wakulla Springs to determine where surface pollutant inputs have the greatest potential to increase nitrate in groundwater, based on information from the aquifer vulnerability assessments (AVAs) that were reviewed during the last meeting. FDEP also looked at the areas with the fastest groundwater travel times to Wakulla Springs and areas with known connectivity to the springs.

For portions of the BMAP basin outside of Leon County and Wakulla County, the Florida AVA was used to identify the most vulnerable areas in the basin. The Leon County and Wakulla County AVAs were used to identify the most vulnerable areas in each of those counties. The BMAP boundary extends from the Gulf of Mexico to the state line and goes out into the upper parts of Gadsden and Jefferson counties. The area below the Cody Scarp has the highest recharge rate and, therefore, the most impact to the groundwater. Dye tracing studies have been conducted in the basin to identify conduits in the groundwater to the springs. How water is moving underground to the springs is an important consideration for identifying areas to focus efforts on.

Steve stated that for this iteration of the BMAP, the focus would be on the area below the Cody Scarp in the most vulnerable areas. PFA1 is the area in the basin that continually contributes to the groundwater flows to Wakulla Springs. This area extends from the Cody Scarp following the FGS line, and it includes all of Leon County’s springs protection zone and most of Wakulla County’s special planning area. PFA1 has the highest flows from the north to the springs and the highest concentration of conduits to the springs. Therefore, this area has the most pathways that move quickly to the springs. PFA2 also has a high probability of infiltration to the groundwater, but has intermittent groundwater contributions to the springs. There is also the question about how much of the flow from the Spring Creek area goes to Wakulla Springs. PFA1 will be the primary focus of the BMAP since it has the most impact. PFA2 is where future efforts would help to improve conditions in the springs and where investigations are needed on how much of the groundwater flow is going to Wakulla Springs. Steve stated that FDEP is looking for feedback from the stakeholders on these proposed priority areas.

Theresa stated that there was discussion at the last meeting about the difference in scales for the Leon County and Wakulla County AVAs and she asked how this was addressed. Steve responded that FDEP is focusing on the area below the scarp because it has the highest recharge level and the most vulnerability. Anita added that the identification of the PFAs only used the “most” vulnerable designation from the Leon County AVA because this equated to the “most” and “more” vulnerable categories in the Wakulla County AVA. Debbie stated that it would be interesting to overlay the springs protection boundaries that Leon County and Wakulla County have already identified to compare them to the PFAs. Steve responded that these springs protection boundaries are included on the maps, although they are difficult to see. Anita added that the springs protection boundaries were evaluated to determine the PFAs. The Leon County springs protection zone follows the Cody Scarp and goes south to the county line. The Wakulla County special planning area was used as part of the boundary for PFA2.

Eberhard asked why the boundary for PFA2 cuts through the more vulnerable areas on the eastern boundary. Steve responded that the PFA2 boundary was drawn this way to exclude some of the isolated pockets of vulnerability and to focus on the most vulnerable areas. There is also some interchange in this area so it is unknown if all of the area that was excluded flows to Wakulla Springs. FDEP is willing to take suggestions on how to modify these boundaries. Debbie asked if there is evidence to show that water in this area does not flow to the springs. Steve responded that it is known that the area within PFA2 does

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flow to the springs. However, in the area between PFA2 and the eastern basin boundary it is more difficult to tell how the water flows. Hal added that it would be difficult to tell where the water flows in this part of the basin because there are other springs in this area. Anita noted that the eastern boundary line for PFA2 was drawn by following the density of the red (most vulnerable) areas on the map.

Dana asked if there are any potential implications of including the sprayfield in PFA1 but excluding the areas of Tallahassee that contribute wastewater to the sprayfield. Steve responded that the focus is on the area south of the Cody Scarp, which only includes the sprayfield. Tiffany added that the area within PFA1 captures where the wastewater source enters the groundwater. Steve noted that the stormwater from Tallahassee flows to Munson Slough before reaching the groundwater. Stormwater is not as much of an issue since it is lower in nitrates. Keith asked what the basis is for this statement, because nitrates can be as high as 10 mg/L in stormwater runoff. Steve responded that he based his statement on the data he has seen for the basin. John Cox added that he has never seen nitrate concentrations that high in stormwater; 0.1 mg/L of nitrates is more typical. Tiffany noted that the entire BMAP area is part of this process, and activities outside of the PFAs will count for reductions. The idea of having PFAs is to focus efforts on areas that have the most direct connections and impacts to the springs. Therefore, the area north of the scarp is not excluded from the BMAP; it is just not the main focus for this iteration. Steve requested any comments on the PFAs boundaries by May 2nd.

Steve stated that the process for the sufficiency of effort evaluation would impact those stakeholders responsible for implementing actions to address nitrate loading. The planning process for implementation of strategies will occur in five-year increments. For this BMAP iteration, the focus will be on those actions that will have the most benefit for the springs. Steve noted that during the last meeting, they discussed that the springs are close to meeting the nitrate TMDL target but there is not enough information to say that the nitrate and biological targets will be met in the next five years. There are future growth and septic tank loads that need to be addressed to help ensure the TMDL will be achieved. Large reductions have been accomplished since the TMDL period as a result of strategies implemented by the stakeholders. However, the full benefits of the strategies may not be seen in the springs water quality currently because there are time lags between implementation and when the water reaches the springs. Therefore, there may still be additional improvement in the springs water quality from these strategies as high nitrate waters are flushed out.

The BMAP process requires identification of mechanisms that will address potential future increases in loading. The sufficiency of effort evaluation will promote development of needed management strategies and promote support for proposed strategies to address potential future increases in loading. FDEP will collect completed, ongoing, and planned management strategies from the stakeholders in PFAs 1 and 2. FDEP will meet one-on-one with the stakeholders in these areas to make sure the BMAP includes a full list of strategies and to discuss actions to address future loads. Structural projects completed since January 1, 2004 are eligible for credit in the BMAP. Ordinances, public education, outreach efforts, and street sweeping are eligible for credit regardless of when they were implemented.

Catherine asked how the year 2004 was selected for projects to be eligible for credit. Steve responded that the traditional approach in BMAPs is to set the credit timeline based on the end of the TMDL period. However, since this is a groundwater driven system and there is a known time lag between strategy implementation and changes at the springs, FDEP selected the halfway point in the TMDL period. Tiffany added that the data used in the TMDL are from 2000-2007. Catherine stated that FDEP seems to have arbitrarily chosen the midpoint in the TMDL period but her understanding was that strategies back to 2000 would be eligible. For a 4e nutrient reduction plan, projects from the entire assessment period can be included. Tiffany responded that in a BMAP, the end of the TMDL period is usually used because actions before then are incorporated in the TMDL calculations. Sometimes, the project timeline is backed up a year because it is assumed that not all of the water quality benefits of projects in that last year were

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accounted for in the TMDL. The timeline was moved further back in this BMAP because it is not known how quickly groundwater moves in this basin. This can be discussed in more detail if the stakeholders have concern about the timeline. The goal is to be fair to the stakeholders that completed projects without overestimating the benefits to the springs if these projects were already reflected in the water quality data. Catherine stated that some of the TMDL assessments were done with the entire dataset, so the results could be weighted by older data.

Theresa stated that there has not been any discussion on the sufficiency of where data were collected in the TMDL and if the same range of locations would be used to verify BMAP compliance. Steve responded that FDEP would be looking for an improvement in nitrate loading to the springs as a result of strategies that are effective, implementable, and feasible. Theresa stated that the BMAP process is iterative and she asked how FDEP would determine what reductions are needed in the second iteration without monitoring. Steve responded that the monitoring plan will be discussed at the next meeting in May to determine how often and where monitoring is needed to determine if the TMDL is being met.

Blas stated that the TMDL requires a 56% reduction in nitrate. He asked how that percentage would be used in the sufficiency of effort approach. Steve responded that FDEP would be looking at this reduction as an element of the TMDL target, in addition to the nitrate concentrations and biological targets. Tiffany added that since detailed allocations will not be used in the BMAP, this percentage of reductions is not being assigned to a particular entity. Blas stated that some discussion is needed on how the 56% reduction will be applied to the PFAs since they are only part of the whole BMAP area. Steve responded that the TMDL used a smaller springshed than the proposed BMAP boundary. The percent reduction was determined by comparing the current nitrate concentration at the spring to the 0.35 mg/L target. Tiffany added that the 56% reduction would not be applied to the individual stakeholders as a reduction requirement. FDEP will be meeting with the entities in PFA1 and the sufficiency of effort process can be discussed in more detail at that time.

Steve Peene asked how FDEP would be calculating credits for the management strategies and if credits would be given for activities outside the PFAs. Steve Cioccia responded that, at this time, FDEP is only evaluating the strategies and not calculating credit. Tiffany added that the tools are not available to calculate credit for a groundwater-driven system. The sufficiency of effort approach will evaluate the sources included in Kirstin's presentation and determine if the strategies provided reduce those sources. This approach will determine if the efforts are sufficient to address the sources, not whether an entity's strategies are adequate.

Debbie stated that PFAs 1 and 2 seem to include the reverse flow scenario where Spring Creek is contributing water to Wakulla Springs. She asked if FDEP is going to try to track where the water is coming from. She also asked how the reverse flow would be addressed in the nitrate calculations. Steve responded that this reversal in flow was a concern and a factor that was taken into account when identifying the PFAs. Anita added that that map in Brian's presentation shows the relative contribution of human inputs, and there are nitrate measurements from the different conduits. As part of the monitoring plan, additional discussion can be had about what monitoring might be needed in this area. Debbie stated that the locations of the primary sources are known but how will the change in nitrate concentration be compared with fluctuating flow. Tiffany responded that the nitrate concentration must be met at the springs regardless of the flow to the springs. Theresa asked if Kirstin's study area would go out to the full BMAP boundary with a new analysis for this area. Kirstin responded that they are planning to expand the study to the BMAP boundary once it is finalized.

Public Comments and Wrap Up

Tiffany stated that the next meeting would be held on Thursday, May 16th at 9:30 AM at the Woodville Community Center.

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Ron stated that Dr. Todd Kincaid (FGS) would be making a presentation at the Wakulla Springs Lodge tomorrow (Friday) night, and all day Saturday is the wildlife festival.

Adjourn

The meeting was adjourned at 12:11 PM.

Action Items

1. Stakeholders interested in reviewing the data or that have questions or comments about the nitrogen loading study can contact Rick Hicks, Kirstin Eller, or Brian Katz.
2. Kirstin will add her contact information to the presentation that will be posted to the FTP site.
3. Stakeholders should provide comments on the PFAs boundaries to Steve Cioccia by May 2nd.
4. FDEP will meet one-on-one with the stakeholders in PFA1 to collect current and proposed management strategies to reduce nitrate loading.